

IAP20 Rec'd PCT/PTO 16 JUN 2006

## Description

The invention relates to an arrangement for testing a power output stage, the power output stage having at least three 5 half-bridges which each comprise a series circuit formed by an upper and a lower semiconductor switch and to which the operating voltage is applied, and the junction points of the semiconductor switches of the half-bridges forming outputs which are connected to windings of an at least three-phase 10 motor, a control device being provided, which switches respectively one or respectively simultaneously a plurality of the semiconductor switches into the on state according to a predetermined program and in the process tests whether the respective voltages at the outputs respectively lie within a 15 predetermined tolerance range for the respective switching state.

Power output stages equipped with semiconductor switches are used inter alia in motor vehicles for driving loads, for 20 example motors. By virtue of the rapid development of low-impedance power MOSFETs, even loads in the kilowatts range can be driven cost-effectively. In motor vehicles it can happen that the power output stage and the load are arranged spatially 25 separate from one another, in which case short circuits of the load feed lines to ground or to battery voltage may lead to high fault currents. Fusible links generally cannot be used in these electric circuits on account of their tolerances, their internal resistances and the high useful currents. Moreover, a 30 high fault current may flow on account of a defective MOSFET in the power output stage.

WO 97/32220 A1 discloses a method and a circuit arrangement for testing a driver circuit for an electrical drive, in which

2003P12616WO  
PCT/EP2004/052882  
22.09.2005

- 2 -

case, for each phase, a lower and an upper semiconductor switch are provided and a control device switches respectively one or

2003P12616WO  
PCT/EP2004/052882  
22.09.2005

- 1a -

respectively simultaneously a plurality of the semiconductor switches into the on state according to a

predetermined program. A test is effected in the process to determine whether, at the outputs to which a motor is connected, a voltage respectively lies within a predetermined tolerance range. The distinguishability of different faults, 5 whether for example a motor winding has a short circuit or a semiconductor switch is permanently in the on state, is limited in this case, however.

Therefore, it is an object of the invention to provide a 10 testing of the power output stages, so that in the case of a short circuit, the operating voltage is switched off or not even switched on in the first place, and the power output stage and the on-board electrical system are thus protected against damage and a more precise determination of faults is possible.

15 This object is achieved in the case of the arrangement according to the invention by virtue of the fact that the feeds to the windings can be interrupted with the aid of further switches.

20 The state of the power output stage and of the connected lines and windings can be assessed in differentiated fashion by means of the method according to the invention, the motor not being influenced, or only being imperceptibly influenced, during the 25 testing. The testing may be effected automatically before the power output stage is respectively switched on, for example when the ignition lock of a motor vehicle is actuated, or else may be carried out during operation. As a result of the isolation of the windings with the aid of the further switches, 30 respectively one to all of the upper semiconductor switches or one to all of the lower semiconductor switches can be simultaneously controlled into the on state, so that a precise fault analysis is possible.

2003P12616WO  
PCT/EP2004/052882  
22.09.2005

- 2a -

One advantageous refinement of the invention consists in the  
fact that the windings of the motor form a star connection, and  
that the further switches are arranged at the star point and in  
5 the